Transcatheter closure of the Gerbode type ventricular septal defect after redo mitral valve replacement

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Abstract

Gerbode defect is an uncommon ventricular septal defect (VSD) resulting in a left ventricle to right atrium shunt. Although typically congenital, acquired defects have been reported following infective endocarditis, cardiac surgery, trauma, or acute myocardial infarction. This condition causes left-to-right intracardiac shunt and potential hemodynamic instability. This complex anatomy poses therapeutic challenges, and optimal management is often unclear. We present a case of acquired Gerbode defect following a redo mitral valve replacement surgery in a 71-year-old man who developed severe dyspnea and pulmonary hypertension. Treatment was successfully performed with percutaneous transcatheter VSD closure using an Amplatzer device. This case highlights the importance of considering Gerbode defects in postoperative patients and demonstrates the efficacy of transcatheter closure in reducing symptoms and avoiding high-risk redo cardiac surgery. Transcatheter repair offers shorter recovery times, reduces pain, and avoids repeat sternotomy, making it a valuable and minimally invasive alternative for patients with acquired Gerbode defects.

Keywords: Gerbode defect, left ventricle to right atrium shunt, redo mitral valve replacement, transcatheter closure

Introduction

Gerbode defect is an uncommon congenital or acquired left ventricle (LV) to right atrium (RA) communication that accounts for fewer than 1% of all cardiac defects.[1] This defect may result in various risks and complications, including volume overload of the right heart chambers, pulmonary hypertension, and ultimately, congestive heart failure. Here, we describe a rare case of acquired Gerbode defect after redo mitral valve replacement surgery.

Case

A 71-year-old man with a history of severe mitral regurgitation underwent bioprosthetic mitral valve replacement (MVR) using a 33 mm Edwards bovine pericardial tissue valve in 2017, which was complicated by sternal wound dehiscence and infection. In 2022, the patient reported progressive exercise intolerance and was found to have severe bioprosthetic mitral stenosis (mean gradient of 11 mmHg). He subsequently underwent a redo MVR with another 33 mm Edwards bovine valve. However, the patient's symptoms persisted post-surgery, prompting further evaluation with heart catheterization and echocardiogram. The echocardiogram demonstrated significant LV to RA shunt with a Qp/Qs ratio of 2.2. Transesophageal echocardiography (TEE) confirmed a large 7.5 × 6.4 mm left to right shunt from the left ventricle to the right atrium (LV-RA shunt) (Figure 1A–B). In addition, a pseudoaneurysm was identified along the inferior atrioventricular groove, complicating any open surgical intervention. Due to his high surgical risk from two previous sternotomies and the pseudoaneurysm, the patient underwent successful TEE-guided transcatheter closure of

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DOI: 10.12746/swrccc.v12i53.1349

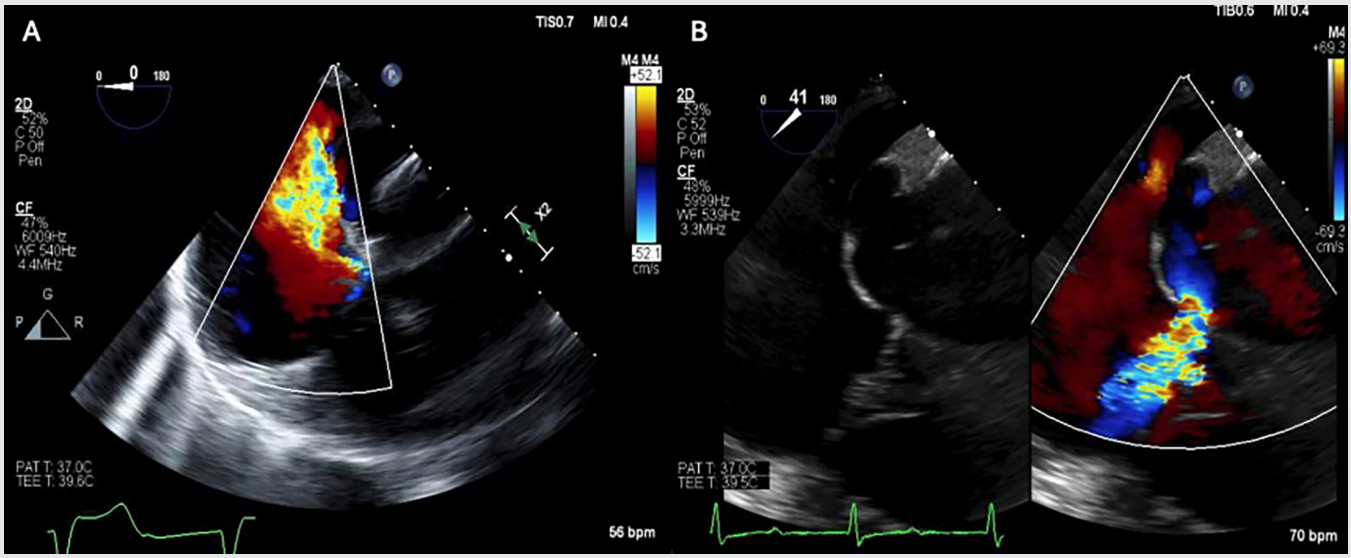

Figure 1. (**A–B**) Transesophageal echocardiography (TEE) long-axis view with color Doppler shows left ventricle to right atrium shunt and turbulent flow through the defect.

the Gerbode defect using a 12 mm Amplatzer duct occluder (ADO 12) (Figure 2A–C).

Procedure description

Access was obtained in the right and left femoral arteries, and the right common femoral vein. The procedure was performed with TEE and fluoroscopy guidance. A left ventricular angiogram delineated the defect's size and location. A JR4 diagnostic catheter was advanced retrogradely into the left ventricular outflow tract, while a Terumo Glidewire was advanced from the left ventricular cavity into the superior vena cava. This wire was snared from the venous end, making an arteriovenous loop. Next, a 9F delivery system was advanced from the venous line to the ascending aorta

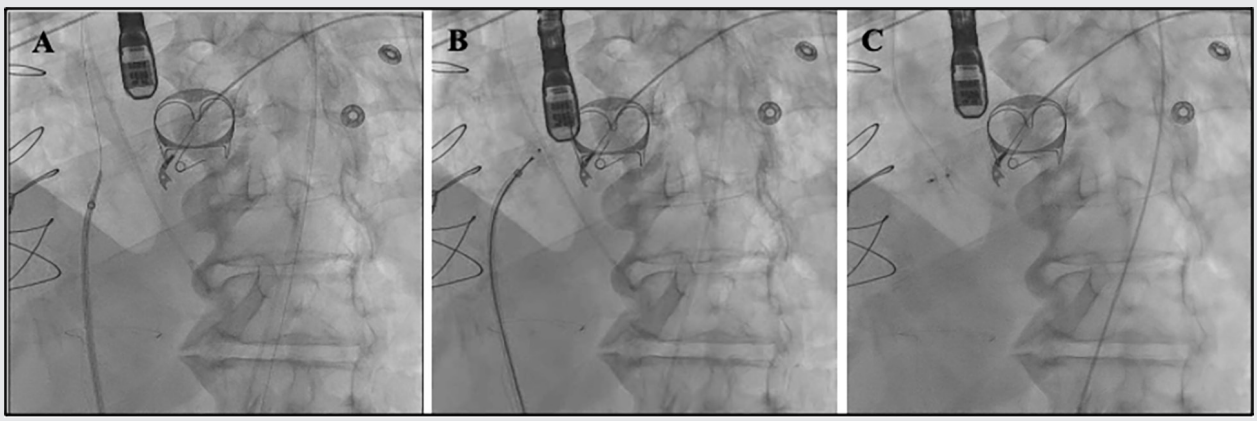

Figure 2. (**A**) 9F delivery sheath. (**B**) Seating and deployment of 12 mm ADO device in defect. (**C**) Resulting Gerbode defect closure with a fitted ADO device.

retrogradely. The defect was closed using a 12 mm Amplatzer duct occluder. Repeat LV angiogram and TEE confirmed the device's position, demonstrating resolution of the LV to RA shunt.

Discussion

Acquired LV-RA shunts, such as Gerbode defects, are uncommon complications often associated with a weakened membranous septum following cardiac operations, infective endocarditis, or trauma.[2–4] A review of the literature suggests that the most common etiology for acquired Gerbode defects is postoperative, particularly following heart valve surgery.[2–4] Redo mitral valve surgery is complex and could potentially cause Gerbode defects. This report demonstrates a safe and effective approach to treat an acquired Gerbode defect following mitral valve surgery via transcatheter device closure.

The abnormal communication in Gerbode defects allows oxygenated blood from the LV into the RA, circulating back to the lungs and bypassing systemic circulation.[1] Clinical presentation can vary depending on the size of the defect and the degree of shunting. Small defects may be asymptomatic and discovered incidentally, while larger defects can lead to symptoms such as heart failure, pulmonary hypertension, and arrhythmias.[1] Echocardiography is crucial for diagnosis, enabling visualization of the defect, quantifying the left to right shunt, and assessing its impact on cardiac function. Spontaneous closure of Gerbode defect is rare; thus, treatment often involves surgical or interventional closure of the abnormal communication.[5] While prognosis could be favorable with conservative management of small defects, complications, such as pulmonary hypertension and heart failure can occur, especially in patients with large defects following heart valve surgery. These hemodynamically significant shunts warrant prompt intervention.

Traditionally, large ventricular septal defects (VSD) are repaired surgically. However, repeat sternotomy in patients with decompensated heart failure and recent cardiac surgery has increased risk. Transcatheter device closure could be an effective alternative for these patients with a high success rate.[6] Singap and colleagues reported comparable efficacy between surgical and transcatheter closure, with the latter having fewer complications.[7] Despite similar long-term outcomes, a transcatheter approach eliminated the need for repeat sternotomies and resulted in a significantly lower residual shunt than surgical closure.[7] A study by Kidwai et al. observed a 100% success rate of transcatheter ADO device closure in patients with residual VSDs after surgical repair.[8] Similarly, transcatheter device closure was associated with lower morbidity and mortality in patients requiring redo cardiac surgery in this study. These publications suggest that percutaneous VSD closure methods can be feasible for patients with a Gerbode defect. For patients with a history of multiple cardiac surgeries and ongoing heart failure symptoms, percutaneous transcatheter VSD closure could be the first strategy for addressing Gerbode-type defects.

Patients who develop pulmonary hypertension, dyspnea, and symptoms of congestive heart failure following redo mitral valve surgery should be investigated for acquired Gerbode defect. Transcatheter repair has emerged as a minimally invasive procedure, with shorter recovery times and reduced pain, and it avoids repeat sternotomy. For these patients, transcatheter device closure is a viable treatment option and avoids subsequent high-risk redo open-heart surgery.

Consent: Informed consent was obtained from the patient for publication of this case report, including accompanying images.

Article citation: Talebi-Talghian T, Cevik C, Hegeman TW, Walinsky PL. Transcatheter closure of the Gerbode type ventricular septal defect after redo mitral valve replacement. The Southwest Respiratory and Critical Care Chronicles 2024;12(53):63–66
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Submitted: 8/2/2024
Accepted: 9/16/2025
Conflicts of interest: none

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